

## SPECIFICATION

To All Whom It May Concern:

Be it known that I, **Al Mitrevics**, a citizen of the United States residing at 243 East Scott Avenue, Gilbert, AZ 85234, respectively, have invented a certain new and useful **GLAZING SYSTEM FOR HOLLOW METAL WALLS**, of which the following is a specification.

## GLAZING SYSTEM FOR HOLLOW METAL WALLS

This application is based on disclosure document no. 446,666, filed September 2, 1998

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### Field Of The Invention

A glazing system for hollow metal walls and more particularly a glazing channel to secure panels into openings in hollow metal walls

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### Background Of The Invention

Storefronts today are typically comprised of a wall made of glass or decorative panels securely mounted in a frame that is divided by mullions to form an array of panels secured to the frame and mullions or between the mullions. Sliding or swinging doors are also typically included as part of the storefront. There are two basic types of storefront systems. Both systems came into popular use shortly after World War I. A system that is manufactured of formed steel is called pressed steel or more commonly now known as hollow metal. The other storefront system is manufactured of extruded aluminum sections and is known as an aluminum storefront. Hollow metal construction is employed in the fabrication of the exterior of buildings as well as the interior. Extruded aluminum is used almost exclusively on the exterior.

The principle benefit that derives from employing the hollow metal system is that its components are welded together and is therefore much stronger than the extruded aluminum, which is frictionally snapped together or assembled with metal fasteners. A major downside of hollow metal systems resides in their appearance, which usually presents an array of multiple lines and fasteners. The main benefit of the aluminum system is that the extruded aluminum lends itself to the creation of a much more aesthetic storefront characterized by smooth clean lines free of any apparent fasteners. Typical of such extruded window mullion and curtain wall structures is that of F.A. Schilling in his U.S. Patent No. 2,866,527 ('527) issued December 30, 1958 where an extruded metal U-shaped mullion has spaced apart side

walls defining an elongated opening. The side walls have on their inner face a saw-toothed rib and an extruded metal cap cooperates with the saw-tooth rib to close the opening. A snap together extruded metal storefront construction is shown and described in S.E. Hubbard U.S. Patent No. 3,081,849 ('849) which includes a metal framing element that consists of stock lengths of matching, interchangeable, extruded moldings designed for field construction to create complete exterior facades, interior facings and partitions. A principal feature of the snap together construction is the creation for appearance sake and protection against vandalism of a storefront so designed as to be assembled without the use of exposed screws or other visible fasteners. A more recent curtain wall structure is that of Parinas et al. as shown and described in U.S. Patent No. 5,253,459 ('459) issued October 19, 1993. Parinas et al. focuses on the provision of an improved four corner joint construction to create a weather tight seal. The use of extruded aluminum allows for a snap together construction where heads of screws employed to secure glass panels in place are hidden by a snap on cap. The foregoing '527, '849, and '459 patents, are all examples of extruded aluminum construction techniques where novelty flows from a basic need to design structures that must take into account the limited number of cross-section configurations that can be formed by one extrusion. In each case a requirement to replace a panel in the wall comes with it an attendant risk of damaging in a highly visible manner the detailed appearance of the mullions and mid-frame structures of storefronts made with the extruded metal components.

Storefronts and curtain walls fabricated with hollow metal frames and hollow metal mullions welded into unified structures typically employ a common method for securing glass or opaque panels into the frame/mullion combination. This common method involves forming a rabbet on an edge of the hollow metal frame or mullion. A rabbet being defined as a cut or a groove along or near the edge of the hollow metal frame or mullion that allows another piece to fit into it to form a joint. In the case of a storefront, for example, the rabbets present in a portion of the frame and associated mullions create a groove about a perimeter of an opening in the storefront. Into this opening a pane of glass or an opaque panel may be inserted. The depth of the rabbet, that is the groove, is made deep enough to accommodate the

thickness of the glass pane or panel and a bead, that is a narrow projecting strip of molding. The bead is provided with a plurality of openings therethrough. Screws are then inserted through the openings and engage corresponding openings in the rabbet of the hollow metal frame or mullion. The beads may be made of glass or metal. The principle drawback of this approach involves esthetics, namely the overall form and beauty of the storefront. It is often said, "beauty is in the eye of the beholder". There is a school of thought that suggests form and function when combined in elegantly simple lines is inherently more attractive and esthetically appealing than a multitude of lines that define the form of parts that make up the whole. The verity of this school of thought is everywhere present in a consumer driven economy. One need go to no further than simple household appliances that have internal mechanisms that are encased in attractive housings. It is believed by many that the highest level of creative design is to be found in structural environments where the form of the outward appearance simultaneously provides by the very nature of the physical form an essential structural function. It is suggested that the desirability of extruded metal storefront structures is principally tied to the esthetics visually presented by these structures. Clearly, hollow metal storefronts are stronger but visually not as attractive as extruded metal because hollow metal storefronts present a large number of lines that come into existence when the hollow metal rabbets and beads with exposed fastener screw heads are employed to mount glass panes or panels in the storefront. The invention to be described hereinafter visually reduces the total number of visible lines in the storefront employing the invention while simultaneously securing glass panes or panels into the storefront with a minimum of parts while providing for quick and easy dismantling in the event the glass or panels need to be replaced. None of these just mentioned desirable attributes can be found in the prior art just reviewed.

#### **Summary Of The Invention**

Simply stated the invention provides a hollow metal storefront or curtain wall structure that utilizes a single simple glazing bead to secure glass panes

or panels in the structure while simultaneously allowing the quick removal of the same.

More specifically, the invention in its broadest and most elegant sense is directed to a bent metal glazing bead that has one elongated leg that has at least one portion thereof of a u-shaped cross-section where one side of the u-shape is short and the other side is long and includes a bridge portion. The elongated u-shaped cross-section and bridge portion form a bead. The elongated u-shaped leg with its long side and bridge portion provide a smooth continuous surface.

The elongated u-shaped cross-section leg is configured to cooperate in a mating fashion with a portion of a support structure to sandwich a panel on the support structure between the short side of the elongated leg and long side bridge portion and an opposing surface portion of the support structure to thereby glaze the panel in place and simultaneously visually present a smooth continuous surface of the glazing bead to mask a junction of the panel with the support structure.

15 In a highly preferred embodiment, the invention is directed to a glazing bead for use in combination with a hollow metal wall having unitary welded frame at its perimeter and may have at least one mullion welded thereto to provide at least two openings in the wall into which openings at least two panels are glazed into the mullion and secured against the frame by means of a glazing bead utilizing the invention. The invention also intended for use where there is simply a single panel surrounded by a frame. The glazing bead in this embodiment takes the form of a bent metal U-shape that has a pair of spaced apart elongated hollow rectangular cross-section legs integrally connected by a bridge element to form a U-shaped channel between the elongated legs, while providing an opposing smooth external continuous surface comprised of a portion of each of the elongated hollow legs and the bridge element. The U-shaped channel of the glazing channel cooperates in a mating fashion with a portion of the mullion to sandwich panels on either side of the mullion between the elongated hollow legs and a portion of the mullion. With the glazing channel in place on the mullion panels on either side of the mullion are simultaneously glazed in place. The resulting structure presents a smooth

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continuous external surface of the glazing channel to cover a junction of the panels with the mullion.

It is therefore a primary object of the invention to provide a glazing bead for use in hollow metal walls to simultaneously secure panels on either side of a mullion to the mullion or to secure a single panel to a frame.

Another object of the invention is to provide glazing channel that present a smooth continuous external surface to cover a junction of wall panels with a mullion or frame while simultaneously locating the panels in place between the glazing channel and the mullion.

Yet another object of the invention is to provide an easily removable glazing channel for use with hollow metal mullions or frames of storefront construction.

Other object and advantages of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

### **Brief Description Of The Drawings**

The description set forth above, as well as other objects, features and advantages of the present invention, will be more fully appreciated by referring to the detailed description and the drawings that follow. The description is of the presently preferred but, nonetheless, illustrative embodiment in accordance with the present invention, when taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a schematic elevation front view of a prior art hollow metal storefront.

FIG. 1a is a rearview of the prior art storefront of FIG. 1.

FIG. 2 is a sectional view taken along line 2-2 in FIG. 1.

FIG. 3 is a sectional view taken along line 3-3 in FIG. 1.

FIG. 4 is a sectional view taken along line 4-4 in FIG. 1.

FIG. 4a is a perspective showing of a prior art bead glazing technique for securing panels to a mullion

FIG. 5 is a sectional view taken along 5-5 in FIG. 1.

FIG. 6 is a schematic representation of a prior art front elevation of a storefront.

FIG. 6a is a rearview of FIG. 6.

FIG. 7 is a sectional view taken along line 7-7 in FIG. 6.

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FIG. 9 is a sectional view taken along line 9-9 in FIG. 6.

FIG. 10 is a sectional view taken along line 10-10 in FIG. 6.

FIG. 11 is a front elevation view of a storefront that embodies the invention.

FIG. 11a is a rear elevation view taken along line 12-12 in FIG. 11.

10 FIG. 12 is a sectional view taken along line 12-12 in FIG. 11.

FIG. 13 and 13a when taken together show a sectional view taken along line 13-13 in FIG. 11 and shows one manner in which a frame maybe formed to receive a panel or pane of glass.

15 FIG. 14 is a sectional view taken along line 14-14 in FIG. 11 and illustrates a preferred embodiment of the invention.

FIG. 14a is a cross-sectional view of a glazing channel that embodies the invention.

20 FIG. 14b is an enlarged partial section of the manner in which a glazing channel that embodies the invention glazes in place panels on either side of a mullion.

FIG. 14c is a perspective section of mullion and panels held in place by glazing channel that embodies the invention.

FIG. 15 is a section taken along line 15-15 in FIG. 11.

25 FIG. 15a is a perspective view of a glazing element shown in cross-section in FIG. 15.

FIG. 16 is a cross-section of a mullion, panels and another type of glazing bead that embodies the invention.

FIG. 16 is a perspective view of the glazing bead shown in FIG. 16.

30 FIG. 17 is a cross-section of a mullion, panels and yet another type of glazing bead that embodies the invention.

FIG. 17a is a perspective view of the glazing bead shown in FIG. 17.

While the invention will be described in connection with certain preferred embodiments, there is no intent to limit it to those embodiments. On the contrary, the intent is to cover all alternatives, modifications and equivalents as included within the spirit and scope of the invention as defined by the appended claims.

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### **Detailed Description Of The Preferred Embodiment**

5001 Reference is now made to FIGS. 1, 1a and 2/5 which illustrate a typical prior art storefront 10. The storefront in this example is shown with windows, i.e., glass panes or panels 11, 12, 13 and 14, as well as a door 16. The door 16 is only shown schematically and it is to be understood that it is mounted to a side door panel 17 by an inference hinge partially shown in FIG. 2. The door 16 when in a closed position interacts with side doorframe 18 in a wholly conventional manner. The storefront 10 also includes top frame 19, side frame 20, bottom frame 21 and vertical mullion 26 and horizontal mullion 27. These just described frame and mullions are manufactured of formed steel, i.e., repressed steel or more commonly now known as hollow metal. Each of these just recited structural elements of the storefront 10 are welded together, by welds not shown, to create a structurally integrated whole.

Attention is now directed specifically to Figures 2-5 where as can be seen in the section shown in FIG. 2 the side doorframe 17 manufactured from formed metal includes rabbets 22, 23 on the door side of the frame. Figure 3 shows the cross-sectional detail of hollow metal side doorframe 18 which is manufactured to include rabbets 24, 25 and 28, 29 to create a generally cruciform cross-section. The glass pane or panel 13 is shown glazed in place by means of a glass bead 31 which is secured as shown to the side doorframe 18 by means of screw fastener 32.

Turning now to FIG. 4 and FIG. 4a, note that FIG. 4a is a perspective view of FIG. 4 rotated through ninety degrees (90°). The vertical hollow metal mullion 26 has a similar cruciform cross-section in which rabbets 33, 34 include glass beads 36, 37 to sandwich and hold in place glass panes or panels 13 and 14. The glass beads 36, 37 are secured to the hollow metal mullion 26 by means of a plurality of screw fasteners 32a, 32b. When glass beading is employed to hold the glass panels or panes in place by screw fasteners the heads of the fasteners generally extend above



the surface of the glass beads and are clearly visible to the naked eye. Because the scale of the drawing of FIG. 1 is so small the heads of the screw fastener are not shown. Side frame 20 in a fashion similar to side doorframe 18 shows glass pane or panel 14 held in place by glass bead 38 in rabbet 39.

5           The reader of this specification is invited to scan FIG. 1 and take note of the visually busy nature of the store front brought about by the great multiplicity of horizontal and vertical lines produced by the edges that define the rabbets and the glass beads.

10           The visual business of the exterior and interior of the storefront 10 of FIGS. 1 and 1a are ameliorated as shown in prior art example of FIGS. 6, 6a and 7-10 by the removal of most of the rabbets on the interior side of hollow metal frames. In FIGS. 8-10 arrows 50, 51, 52 and 53 point to the regions of the hollow metal frames 17a, 18a, 20a and mullion 26a on the storefront interior where the rabbets have been removed. In the exterior doorframe sections 17a, 18a arrows 53, 54, FIGS. 7 and 8  
15           are also shown removed. This action of removing the rabbet region of the hollow metal structure reduces the visual business of interior appearance of the storefront as seen in FIG. 6a, but does little to relieve the visual business blight of the storefront as depicted in FIG. 6.

20           Attention is now directed to the series of Figures beginning with FIGS. 11 and 11a through FIG. 15 which depict a hollow metal storefront 10' which is esthetically enhanced by the incorporation of the subject invention to eliminate the visual business that encumbered prior art storefronts. In the description that follows reference numerals that designate similar structural components or details described in earlier figures will employ the same reference numeral that will be modified by  
25           the inclusion a prime above and adjacent the numeral.

          Attention is now directed to FIGS. 11 and 11a which depict a preferred embodiment of the invention. FIG. 11 depicts an exterior storefront 10' and in FIG. 11a shows an interior of storefront 10'. It should be immediately apparent that the multiplicity of vertical and horizontal lines visible on the storefront 10' exterior, FIG.  
30           11 and interior FIG. 11a have vanished. Construction of the highly esthetic appearance of the exterior and interior of the storefront 10' will now be set forth in

conjunction with an explanation of the details of the invention as seen with particular reference to FIGS. 14, 14a, 14b and 14c.

Before focusing on the invention per se it will be seen that in FIG. 12 the rabbet in the side doorframe 17' has been removed as was explained with respect to FIG. 7. In FIGS. 15 and 15a, the simplest and most elegant embodiment of the invention is shown for securing a glass pane or panel to a side frame 20'. In FIG. 13, the side doorframe 18' is shown with an integral pocket 30 into which window or panel 13' maybe slid into the pocket 30 as shown in FIG. 13a. Where appropriate, a frame or mullion may be manufactured with a pocket of the nature just described.

Attention is now directed to FIG. 15 and 15a where there is shown an alternative approach for securing a window or panel to a frame or one side of a mullion. In FIGS. 15, 15a there is shown a glazing bead 60 that embodies the invention. FIG. 15a shows in a perspective view the glazing bead 60. As is readily apparent when FIG. 15a is studied, the glazing bead 60 has an elongated hollow rectangular cross-section leg 61 and an integrally formed bridge element 62 which functions to bridge the elongated hollow leg 61 to the side frame 20'. The elongated hollow leg 61 and bridge element 62 of glazing bead 60 create an opposing external, smooth continuous surface 70 (see FIG. 11) comprised of a portion of the elongated hollow leg 61 and the bridge element 62 (see FIGS. 15, 15a). When FIG. 15 is examined it will be seen that the elongated hollow leg 61 is configured to cooperate in a mating fashion with a portion of the unreferenced rabbet formed in side frame 20' to thereby sandwich the panel 14' on the side frame 20' between the elongated hollow leg 61 and an unreferenced opposing surface portion of the rabbet formed in the side frame 20' to thereby glaze the panel in place and simultaneously visually present the smooth continuous surface 70 of the glazing bead 60 to mask a junction of the panel with the side frame 20'. The rivet 47' which may be of the "pop-rivet" type is shown in place in FIG. 15 in an opening 45' (FIG. 15a) to mechanically secure the bridge element 62 to the side frame 20'. In order to remove the glazing bead 60 one need only drill out the pop-rivet 47 by inserting a drill bit not shown into the center of the pop-rivet 47. Removal of the glazing bead 60 in the manner just described leaves the glazing bead 60 free of any visual damage.

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Attention is now directed to FIGS. 14, 14a, 14b and 14c where a detailed explanation of the invention will unfold. FIG. 14 depicts a section view of vertical mullion 26' taken along line 14-14 in FIG. 11. Arrows 51', 52' point to regions of the hollow metal vertical mullion 26' where the rabbets have been removed as was described earlier with reference to FIG. 9. Window pane/panels 13', 14' are shown positioned in rabbets 33', 34'. Immediately beneath FIG. 14 in FIG. 14a the glazing channel 40 embodying the invention is shown in cross-section. The glazing channel 40 includes a pair of spaced apart elongated hollow rectangular cross-section legs 41, 42 which are interconnected by a bridge element 43. This just described structure creates a U-shaped channel 44 between the elongated legs 41, 42. The elongated nature of the legs 41, 42 may be better appreciated by a study of FIG. 14c. FIG. 14c is simply a perspective view of a rotated view of FIG. 14b which shows the glazing channel 40 as it is intended to be used. Returning to FIG. 14a, the bridge element 43 is provided with an opening 45. The opening 45 may be included during the fabrication of the glazing channel 40 or added just prior to placing it over the tongue shaped end 46 of the mullion 26' formed by the presence of rabbets 33', 34'. A rivet fastener 47 is shown adjacent opening 45 in bridge element 43. In FIG. 14 there is shown in axial alignment with opening 45 and rivet 47 an opening 48 in the tongue shaped end 46. The opening 48 is normally made after the glazing channel 40 embodying the invention is fitted over the tongue 46. In FIG. 14c one can easily see that the invention provides a smooth continuous surface 49 comprised of a portion of each of the elongated hollow legs 41, 42 and the bridge element 43. In FIGS. 14b and 14c the U-shaped channel 44 of the glazing channel 40 is shown cooperating in a mating fashion with the tongue shaped end portion 46 of the mullion 26' to sandwich panels 13', 14' on either side of the mullion 26' between the elongated hollow legs 41, 42 and surface portions 48, 48a of the mullion 26'. (See FIG. 14b). When FIG. 14c is examined it will be noted the glazing channel 40 embodying the invention when employed as described above will simultaneously glaze both sides of the mullion 26' and thereby present an external appearance of the smooth continuous surface 49.

Reference is now made to FIG. 16 which illustrates another species of glazing bead in use that embodies the invention. In FIG. 16 a mullion 64 is shown with panels 65, 66 held in place with glazing bead 67 secured as shown to the mullion 64 by an unreferenced rivet.

5        FIGS. 17 and 17a in a similar fashion depict still yet another species of glazing bead 68 secured as shown to a mullion 69.

      With specific reference to FIGS. 16, 16a it will be noted that the glazing bead has a pair of elongated legs 70, 71. Each leg has at least one portion 72, 73 thereof having u-shaped cross-section where one side 74, 75 of the u-shape is short and the  
10       other side is long and includes a bridge portion 76 that establishes a smooth continuous surface.

      A review of FIGS. 17 and 17a reveals that the glazing bead 68 differs from the glazing bead of FIGS. 16 and 16a in that the short sides 74', 75' of the glazing bead 68 includes structural return elements 77, 78.